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Merger Announcements and Insider Trading Activity in India: An Empirical Investigation

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I. Introduction

It is widely accepted that insiders' trading activities generate interest, sometimes create panic and also increase the trading volume of other market participants. Most financial analysts keep track of insider trading, and some advisory services specialize in gauging insiders' transactions. Business dailies and Financial Journals are preoccupied with trends in insider trading. It is generally supposed that corporate insiders have access to information superior to that of outsiders. An inference sometimes drawn from these articles is that insider trading is based on inside information or nonpublic information and is therefore a violation of law.

Of all white-collar crimes, insider trading probably is the most pervasive and acquiesced with. Lax regulations and the ease with which a manager can access sensitive information to profitably manipulate stock prices are, of course, what drives this nefarious practice. The most radical line of reasoning objects to any form of trading that is on the basis of differentials in information. It is argued that unrestricted insider trading will lead to a breakdown of capital markets which are unable to perform their role efficiently. The least restrictive view of insider trading sees insider trading as illegitimate only if it involves a breach of fiduciary duty or at least a breach of trust and confidence[1] . Thus, the profits that managers make at the expense of their shareholders would be an abuse of the relation of trust, which links managers to their shareholders, as the gains accrue on the basis of information, which the managers have obtained by virtue of their position. The primary argument against insider trading is that it works to the disadvantage of outside investors who would then exit the

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[1] Dennert Jurgen, "Insider trading." Kyklos, Vol. 44, Fasc.2, 181-202.

marketplace, taking their capital with them. The argument in favor of allowing insider trading is that such trading leads to more informative security prices.

1.1 Motivation

The possible link between insider trading and the publication of inside information has been recognized in Hirshleifer (1971) and Fama and Laffer (1971). Those who possess privileged information have an incentive to take market positions on the basis of their information and then announce their information publicly. This issue is challenging to investigate empirically because isolating trading based on private information is difficult. The prevailing view among policy makers is that the functioning of orderly financial markets requires that such activity be minimized.

1.2 Objective of the Study

With the above as a backdrop, our aim is to empirically investigate the existence of insider trading prior to merger announcements in India. The study will examine the impact of inside information on trading in advance of planned merger announcements by focussing on the daily stock price movements and volume traded of *target* companies prior to the first public announcement of their proposed mergers. The present paper attempts to examine potential implications of the desire for fairness. Common small investor is afraid of being exploited in the future by better-informed traders. Here regulating authorities' need to protect the small investors. The paper's analysis of insider trading also has broad implications for the debate over how best to regulate securities markets.

1.3 Organization of the Paper

This paper is organized as follows. Section II covers the literature review encompassing both the theoretical literature and the empirical literature. Further, it also deals with the Indian capital market situation vis-à-vis insider trading activity. The empirical investigation for India is covered in Section III. Finally, section IV presents the summary, conclusions and policy implications of the study. It also lists the possible areas of extension of the study.

II. A Review of the Literature

2.1 Insider Trading and Insider

"Insider trading" is a term subject to many definitions and connotations and it encompasses both legal and prohibited activity. Insider trading can occur when a person who possesses material non-public information trades in securities on the basis of such information or communicates such information to others who trade. The person who trades or "tips" information violates the law if he has a

fiduciary duty or other relationship of trust and confidence not to use the information. The most common examples of insider trading involve corporate officers and directors; they owe a duty either not to trade the securities of their own company or not to disclose any material non-public information they possess. Trading is also prohibited when a person who receives information through a confidential relationship uses ("misappropriates") the information for his or her own trading or tips to others. People who receive information in confidence can include a broad range of persons involved in the securities markets. In USA, from time to time, the Security Exchange Commission has charged investment bankers, arbitrageurs, attorneys, law firm employees, accountants, bank officers, brokers, financial reporters and even a psychiatrist with misappropriating information and violating insider-trading prohibitions.

The American notion that insider trading is wrong was well established long before the passage of the federal securities laws. In 1909, the United States Supreme Court held that a director of a corporation who knew that the value of the stock of his company was about to skyrocket committed fraud when he bought company stock from an outsider without disclosing what he knew.[2] But this condemnation is not universal, even in the United States.

By Securities and Exchange Board of India (Insider Trading) Regulations, 1992: "**insider"** means "any person who, is or was connected with the company or is deemed to have been connected with the company, and who is reasonably expected to have access, by virtue of such connection, to unpublished price sensitive information in respect of securities of the company, or who has received or has had access to such unpublished price sensitive information."

To most people it appears rather unjust that some speculators are able to earn profits at the expense of others who just happen to know less about the asset in question. Securities and Exchange Board of India (SEBI) has also put in place the disclosure norms for the office bearers of the stock exchange and directors of Asset Management Companies (AMCs) to prevent insider trading. The directors of AMCs are required to file the details of the purchases and sales of transactions on quarterly basis.

Indeed, the European Economic Community has formally recognized the importance of insider trading prohibitions by passing a directive requiring its members to adopt insider trading legislation. The preamble to the directive stresses the economic importance of a healthy securities market, recognizes that maintaining healthy markets requires investor confidence and acknowledges that investor confidence depends on the "assurance afforded to investors that they are placed on an equal footing and that they will be protected against the improper use of inside information."[3] These precepts echo around the world, as reports of increased insider-trading regulation and enforcement efforts are daily news.

[2] *Strong v. Repide*, 213 U.S. 419 (1909).
[3] Council Directive 89/592 Coordinating Regulations on Insider Trading, 1 Common Mkt. Rep. (CCH) 1761.

2.2 Inferring information about illegal insider trading

Insider trading is an extraordinarily difficult crime to prove. The underlying act of buying or selling securities is, of course, perfectly legal activity. It is only what is in the mind of the trader that can make this legal activity a prohibited act of insider trading.

Direct evidence of insider trading is rare. There are no smoking guns or physical evidence that can be scientifically linked to a perpetrator. Unless the insider (trader) confesses his knowledge in some admissible form, evidence is almost entirely circumstantial. The investigation of the case and the proof presented to the fact-finder is a matter of putting together pieces of a puzzle. It requires examining inherently innocuous events – meetings in restaurants, telephone calls, relationships between people, trading patterns – and drawing reasonable inferences based on their timing and surrounding circumstances to lead to the conclusion that the defendant bought or sold stock with the benefit of inside information wrongfully obtained.[4]

Given this, how likely is it that the market can infer the existence of illegal insider trading? In the United States, which has severe punishment associated with insider trading, people who acquire inside information and trade on it have strong incentives to disguise their behaviour. There are many mechanisms used by regulators to detect illegal insider trading. For example, the New York stock exchange monitors trading of all of its listed stock and uses statistical screens to identify unusual patterns of price and volume. These events trigger investigations by calling the affected company to ask whether there is material information that could be causing the unusual trading pattern. In extreme cases, the Securities Exchange Commission (SEC) is notified and it begins its own investigation. Faced with knowledge of these enforcement mechanisms, sophisticated traders who have inside information try to avoid trading patterns that would lead to easy detection by spreading their trading over many accounts and brokerage firms, and by spreading their trading over time. Even if there were no legal costs associated with insider trading, insiders have strong incentives to disguise their behaviour so that other traders cannot easily infer the information they possess from their trading behaviour.[5]

In case of India, SEBI's surveillance department is tracking the price and volume movements in the scrips, which have suddenly turned favorites. It has also asked stock exchanges to keep a track of counters witnessing high volatility. SEBI's surveillance aims to check possibilities of insider trading which

[4] Speech by SEC Staff: Insider Trading –A U.S. Perspective Remarks by Thomas C. NewkirkAssociate Director, Division of Enforcement Melissa A. Robert, 16th International Symposium on Economic Crime, Jesus College, Cambridge, England September 19, 1998

[5] G. William Schwert, "Mark-up Pricing in Mergers and Acquisitions." NBER Working paper series, September 1994, Cambridge.

sometimes manifest through volatility in a particular counter just prior to important announcements of takeovers.[6]

2.3 Theoretical Framework

Numerous studies of insider trading have appeared in the past two-three decades. Most of these have found that insider trading does take place and insiders earn abnormal return. The theoretical framework that has been used to interpret these findings has been the hypothesis that the stock market is efficient (see Fama 1969, 1976). Fama has done a great deal to operationalize the notion of capital market efficiency. He defines three types of efficiency.

- First is the *Strong-form efficiency:* No investor can earn excess returns using any information, whether publicly available or not.
- Second is the *Semistrong-form efficiency*: No investor can earn excess returns from trading rules based on any publicly available information. Thus this hypothesis admits the possibility of making abnormal returns by those possessing inside information.
- Third one is *Weak-form efficiency*: No investor can earn excess returns by developing trading rules based on historical price or return information.

For our discussion it is useful to distinguish between the two major roles of capital markets in the investment process. Firstly, they coordinate the allocation of new real capital among different firms, both directly and indirectly. The direct way would be through the issue of new shares. The indirect influence is exercised through the implicit determination of the necessary rates of return for internal financing of new investments. If managers act in the interest of the shareholders their investment decisions should depend on these rates of return; one might shed some doubt on this assumption. Secondly, capital markets organize the reallocation of already existing real capital to a different production context (through friendly or hostile mergers).

2.4 Empirical Literature

Finnerty (1976) concludes that the occurrence of profitable insider transactions implies that, "trading on inside information is widespread" and that "insiders actually do violate security regulations." Keown and Pinkerton (1981) provide evidence of excess returns earned by investors in acquired firms prior to the first public announcement of planned mergers. As per their view systematic abnormal price movements can be interpreted as prima facie evidence of the market's reaction to information in advance of its public announcements. Many cases of insider trading frauds involved knowledge of an impending takeover,

[6] "Watchdog out to sniff insider trading on takeover front." The Economic Times, March 18th 1998.

in Meulbroek's (1992) sample of illegal insider trading involves corporate control transactions, Agarwal and Jaffe (1995) examined empirically whether the short-swing rule (Section 16b of the securities Exchange Act)[7] deters managers from trading before mergers.

On the other hand, Seyhun (1986) examining transactions reported to the SEC, finds that corporate insiders earn excess return that are on average small. Elliot, Morse and Richardson (1984) and Givoly and Palmon (1985) analyze the timing and frequency of corporate transactions surrounding news announcements. Both studies conclude that corporate insiders do not trade on inside information. Chakravarty and McConnell (1999) have analyzed the trading activities of a confessed insider trader, and their tests were also unable to distinguish between the price effect of informed trader and uninformed trader. Further, Jarrell and Poulsen (1989) asserts that legitimate sources such as media speculation concerning the upcoming takeover and the bidder's purchase shares in the target firm, contribute to the target's stock price run-up.

In spite of the evidence that in general suggests that insiders be informed, it is still debatable whether outsiders can profit from knowing what insiders are doing. In a more recent study, Bettis, Vickrey, and Vickrey (1997) show that outside investors can earn abnormal profits, net of transaction costs, by analyzing publicly available information about large insider transactions by top executives. Moreover, Manne (1966) and Carlton and Fischel (1983) assert that insider trading fosters efficient capital markets by improving the accuracy of stock prices. Specifically, insider trading promotes quick price discovery, which mitigates the incentive for many individuals to collect the same information.

In order to determine the effectiveness of insider trading laws, Arturo Bris (2001) has gathered information on insider trading in 52 countries in the world and has analyzed a firm's stock reaction before a tender offer announcement on a sample of 4,541 acquisitions. It has been found that profits to insiders, calculated over the fifty-five days that precede a public announcement, increase after insider-trading laws are enforced. Nevertheless, the study reports evidence showing that the toughness of the law matters. This is why providing civil, as well as criminal liability is vital to an effective insider trading program. While it is possible to prove beyond a reasonable doubt (the standard in a criminal case) that a defendant engaged in insider trading based entirely on circumstantial evidence, it poses significant challenges and, in fact, almost all successful criminal insider trading prosecutions in the United States have rested at least, in part, on the testimony of cooperating witnesses. The burden of

[7] Section 16 of the 1934 Act of Securities Exchange Commission of USA requires certain corporate insiders, in particular officers, directors and 10 % owners of any class of equity securities, to report their registered equity holding in the companies stocks to the SEC. Section 16 also requires corporate insiders to return to the issuer any profit earned on holding periods of less than six months; and to refrain from short sales.

proving a purely circumstantial case is less onerous in the civil context, where guilt need be shown only by a preponderance of the evidence, rather than beyond a reasonable doubt, and where the use of presumption may shift the burden of proof to the defendant under certain circumstances.

2.5 Insider trading and cost to Investors

Illegal insider trading costs investors millions of dollars a year by inflating the cost of mergers and acquisitions, according to a Harvard Business School study.[8] Between 1974 and 1990, bidding companies paid an extra $4 billions as a result of trading on information unavailable to the public. Meulbrock in, "Insider trading is tremendously costly for the bidding companies," has found that when insiders ran up the stock price of the company being acquired before the announcement, buyers ended up paying a 30 per cent higher premium for the company, on average, than they otherwise would have. Insider trading could even drive up the stock price so much that the takeover would no longer be practical.

2.6 Indian Scenario

Securities and Exchange Board of India (SEBI) prohibits fraudulent and unfair trading practices, including insider trading and self-dealing. Insider trading is defined as "tak[ing] place when insiders or other persons who, by virtue of their position in office or otherwise, have access to unpublished price sensitive information relating to the affairs of a company and deal in the securities of such company or cause the trading of securities while in possession of such information, or communicate such information to others who use it in connection with the purchase or sale of securities".

2.6.1 Penalty for insider trading[9]

If any insider who,-

(i) either on his own behalf or on behalf of any other person, deals in securities of a body corporate listed on any stock exchange on the basis of any unpublished price sensitive information; or

(ii) communicates any unpublished price sensitive information to any person, with or without his request for such information except as required in the ordinary course of business or under any law; or

(iii) counsels, or procures for any other person to deal in any securities of any body corporate on the basis of unpublished price sensitive information, shall be liable to a penalty *not exceeding five lakh rupees* (emphasis added).

[8] Bloomberg Business News, New York, October 1996.

[9] The Securities and Exchange Board of India Act 1992, (Act No.15 of 1992) Chapter 6-A, Penalties and Adjudication.

However, implementation of the Act is problematic. Despite full-fledged electronic trading facilities at the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE), it is difficult to flag a trade as a possible case of insider trading. Given the number of brokers and intermediaries who operate in the market, a person with insider information can create fire-walls between himself and the regulators. An additional factor making surveillance more difficult, are multiple listings, which are common. The main surveillance responsibility rests with the principal stock exchange. If the regional exchange does not have a sophisticated surveillance mechanism, monitoring compliance becomes almost impossible. Despite this handicap, SEBI has initiated probes in several cases of insider trading.

L.K. Singhvi, Senior Executive Director, in charge of enforcement, investigations and surveillance, said: "We welcome the market movements as they are good from the investors point of view. But we have to check for movements which are detrimental to investors, especially if such movements are witnessed prior to certain announcements and are of abnormal nature or are at the cost of the other investors." To cite, the share price of Pentafour Software moved from Rs. 144.75 on December 1, 1997 to Rs. 359.50 on March 6, 1998, on rumors of an impending takeover of the company. Following news reports of India Cements making a bid for Rassi Cement and the subsequent announcement by India Cements, the latter's share price moved up from Rs. 56.50 on December 1, 1997 to Rs. 239.10 on March 6, 1998.

In 1998, Indian financial markets were rocked by massive share price rigging fraud involving reputed industrial groups such as BPL, Sterlite and Videocon. No punitive action has been taken so far by SEBI against the main offenders.

The latest controversy is related to the rigging of share prices of a private bank, Global Trust Bank (GTB). It has been alleged that Ketan Parekh and his associates rigged the share prices of the GTB prior to its merger with the UTI Bank, in order to improve the swap ratio in favor of GTB. With Parekh and his associates being the major traders, the share price of GTB rose from Rs.70 in October 2000 to Rs.117 within three weeks. It is only now when the bank merger had already been announced that investigations have been launched to look into Ketan Parekh's role in alleged insider trading. The interim investigations carried out by India's regulatory authority, Securities and Exchange Board of India (SEBI) found "evidence of a nexus" between Ketan Parekh and Ramesh Gelli, promoter of GTB.[10]

Unfortunately, in most of the instances, the response of the regulatory agencies has been reactive rather than proactive. Like popular Indian movies,

[10] Financial Frauds and Market Crashes: Casino Capitalism Indian-style Kavaljit Singh Report on recent financial market crash in India 09 April 2001 09:57 UTC

the regulatory agencies came into the picture when the damage had already been done. This is despite the fact that regulatory authorities have an armory of instruments at their disposal to prevent such frauds. According to L C Gupta, former member of SEBI Board, even when actions are taken, they are generally ad hoc in nature. Because of these reasons, there is a growing feeling that the regulatory authorities, particularly the SEBI, tend to protect the interests of big players rather than small investors.

III. Empirical Investigation for India

The inference that insider trading creates significant price revisions observed on insider trading days is premature without a better understanding of the mechanism by which inside information becomes incorporated into stock price. Besides price runups, it is also common to see unusually *high levels of share trading volum*e before announcements of merger and acquisition activity. Hence, one possibility is that the insider trading volume signals the presence of an informed trader. Keown and Pinkerton (1981) find a significant volume pattern prior to the merger announcement apart from a significant build up in the cumulative average return. Easley and O'Hara (1987) present a model where informed traders prefer to trade large amounts. Pound and Zeckhauser (1990) show that takeover rumors published in the "Heard on the street" column of the Wall Street Journal often mention unusual price and volume behaviour for the stock in question. Meulbrock (1992) shows that trading volume is unusually high on days when insiders trade before takeovers. She also shows that trading volume is unusually high during the 20 trading days before takeover bids, even after netting out the trades of insiders who were prosecuted for insider trading. An alternate, but not mutually exclusive, hypothesis is that other trade characteristics, such as trade frequency or direction, lead to the incorporation of the inside information. In the context of examining the price-setting behaviour of the NYSE specialist, Peterson and Umlauf (1990) provide empirical support for this hypothesis. Using detailed transaction data, they report that trade size, direction, and number of trades affect the specialist's quotes.

With this as a backdrop, the empirical investigation that we have used to infer the presence of insider trading is based on the examination of *daily* closing stock price and *daily* trading volume pattern of the selected *target* companies. This analysis has been done for 165 trading days surrounding the merger announcement date, including the date of announcement. This covers 150 trading days prior to the announcement and 15 days on and after the announcement. This section presents a detailed account and application of both these mutually complementary aspects of analysis.

3.1 The Sample

In order to carry out the analysis a database on merger[11] announcements has been constructed for the four-year period 1996-99. The primary source of merger announcement is the news item as it appears in the national dailies viz., Economic Times, Business Standard, Business Line etc. We consulted the news-clippings from the library of the Institute of Studies in Industrial Development (ISID), New Delhi where these are compiled on a regular basis. The choice of the period is based on the available evidence[12] relating to merger activity in the country, which suggests that the incidence of mergers have spurted in the second-half of 1990s as compared to the first-half. This exercise gave us names of **139** target companies with their respective date of merger announcement.

Further, for each of these companies we obtained data on stock prices and trading volume from CMIE-PROWESS, www.indiainfoline.com and www.bse-india.com. However data on these variables was available for **99** of the selected companies. Of these, in case of thirty-two companies there was no data available for ten days immediately preceding the announcement date. Given that the investigation carried out in this study emphasizes on the behaviour of stock prices and trading volume immediately prior to the merger announcement, these thirty-two companies were deleted from the sample. This reduced the number of companies to **67**.

3.2 Methodology using Stock Prices

In the context of analysis based on stock prices, systematic abnormal price movements can be interpreted as prima facie evidence of the market's reaction to information in advance of its public announcement. To this effect, abnormal returns occurring prior to the merger announcement has been calculated by making use of residual analysis.

For each of the sample securities daily rates of return is calculated as

$R_{jt} = \ln(P_{jt}) - \ln(P_{jt-1})$

where

P_{jt} = closing price for security j on day t

For each of the security, adjustment in the stock price is made for any bonus issue on the ex-bonus date. The stock return on the ex-bonus date is derived by the actual price prevailing on that date *minus* the theoretical price, worked out on the basis of bonus ratio.

The following market model is used to estimate abnormal returns for each stock *j*:

[11] We have considered cases of merger as defined by the Companies Act, 1956 where the approval of a high court is required.

[12] Database on Mergers in India compiled at the Centre for Development Economics, Delhi School of Economics, Delhi.

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt} \qquad t = -150, \ldots, -51 \qquad (1)$$

where

α_j, β_j = the intercept and slope respectively of the linear relationship between the return of stock *j* and the returns of the BSE Sensex;

R_{jt} = the return on stock *j* on day *t*;

R_{mt} = the return on the BSE (30 scrips) index on day *t*;

ε_{jt} = the unsystematic component of firm *j's* return

For the purpose of our study we have calculated returns on the market index by taking the BSE Sensex[13] as the market benchmark. Further, for the study "*estimation window*" covers the period from 150 trading days prior to the announcement to 51 trading days before the announcement date thus giving us a total of 100 observations for estimation purposes. The parameters of the model have been estimated for a period away from the period surrounding the announcement in order to avoid bias in the estimation of the parameters due to the event itself. The model has been estimated for companies with at least 50 observations available for the estimation window. This reduced the number of companies from 67 to **61**.

3.2.1 What is the announcement date?

The announcement date is one when the target company is first publicly disclosed as a possible merger candidate. Some public announcements are made after the market closes and some are made before. Importantly, in the latter case, market reaction takes place a day before the merger news appears in the national dailies. Hence, in this case we might *incorrectly* interpret the market reaction a day before the news appeared in the national dailies as existence of "abnormal return" based on trading on non-public information. Thus, in order to eliminate this bias the announcement date is defined as a range covering the date when the news appeared in the national dailies and the immediately preceding day, if it is a trading day. In this case, stock price for day '0' i.e. the announcement date is calculated by taking a simple average of prices on the day when the news appears in the national dailies and on the immediately preceding day, if it is a trading day.

3.2.2 Modification of the market model

Most of the stocks comprising our sample were found to be infrequently traded[14] during the period under study. Given this, we calculated their returns on a trade-

[13] BSE SENSEX is a "Market Capitalization-Weighted" index of 30 component stocks representing a sample of large, well-established and financially sound companies. It is the benchmark index of the Indian Capital market and one, which has the longest social memory. In fact, the SENSEX is considered to be the pulse of Indian stock markets.

[14] A particular stock is defined as infrequently traded if no trading is done in this stock even though the market is open as suggested by the existence of data on BSE Sensex for this day.

to-trade basis, and regressed these using OLS on returns on the market index calculated over precisely the same trade-to-trade time intervals. However, in this case the returns will be measured over periods of different lengths. Assuming the variance of the residuals is approximately proportional to the length of the period, we will be in a heteroscedastic situation. In such a situation the market model can be adapted to handle these unequal length periods and a weighting scheme introduced to avoid heteroscedasticity (Marsh 1979). Thus, the parameters for stock *j* are estimated from the multiple regression,

$$R_{js}(t_s - t_{s-1})^{-\frac{1}{2}} = \alpha_j (t_s - t_{s-1})^{-\frac{1}{2}} + \beta_j R_{ms}(t_s - t_{s-1})^{-\frac{1}{2}} + v_{js} \qquad (2)$$

where returns are measured from trading day (s-1) to trading day (s) throughout the estimation interval t_s = -150, …, -51.

According to Dimson (1979), the trade-to-trade method requires a market index of frequently traded share prices which is recorded many times per period. The main drawback of the trade-to-trade method is its data requirement. The method *cannot* (emphasis added) be used when the times of recording share prices within a time interval are unknown, or when a good proxy for a continuously recorded market index of transaction prices is unavailable. Since the BSE Sensex and the stock prices of the selected companies passes these requirements our analysis is based on the estimation results as obtained from the modified market model (2). We used the econometric package EViews to carry out the estimation.

3.2.3 Diagnostic Tests

We assessed the quality of the estimation results along the dimensions as given below and made appropriate corrections wherever required. For further discussions on diagnostic tests refer to Applied Econometric Time Series (Walter Enders) and Econometric Methods (Jack Johnston & John DiNardo).

a) Serial Correlation: A common finding in time series regressions is that the residuals are correlated with their own lagged values. This serial correlation violates the standard assumption of regression theory that disturbances are not correlated with other disturbances. The Breusch-Godfrey Lagrange multiplier test is used to detect the presence of serial correlation. With the aid of autocorrelations and partial autocorrelations of the equation residuals, appropriate Autoregressive Moving Average (ARMA) terms is used to correct for the presence of serial correlation. Standard criteria such as statistical significance of the coefficients of the ARMA terms, adjusted R-square, Akaike information criterion and Schwarz criterion is used to select the best fitting model.

b) Heteroscedasticity: We employed the White's test for detecting heteroscedasticity in the error terms. This is a test for heteroscedasticity in the residuals from a least squares regression. Ordinary least squares estimates are consistent in the presence heteroscedasticity, but the conventional computed standard errors are no longer valid. If there is evidence of the presence of heteroscedasticity, then one should either model the heteroscedasticity to obtain more efficient estimates or use the White's Heteroscedasticity-Consistent Standard Errors. We made an attempt to correct for this problem by estimating the modified market model as discussed above. Subsequently we found the presence of heteroscedasticity in the case of four companies. For these four companies we use the White's Heteroscedasticity-Consistent Standard Errors.

c) Stability of the parameters of the modified market model: Chow's Breakpoint test is employed to examine whether the parameters of the model are stable across the first 40 observations (-150, …, -111) and the last 40 observations (-90, …, -51) relative to the announcement date. In order to carry out this test we partitioned the data into three sub-samples by specifying two breakpoints at –110 and –90. For all the companies the parameters were found to be stable for the specified breakpoints.

d) Autoregressive Conditional Heteroscedasticity (ARCH)/Generalised ARCH (GARCH): This particular specification of heteroscedasticity has been motivated by the observation that in many financial time series, the magnitude of residuals appear to be related to the magnitude of recent residuals. ARCH models are specifically designed to model and forecast conditional variances. After taking care of serial correlation, we used the ARCH LM test and the correlogram of squared residuals to detect and correct for the presence of ARCH/GARCH in the residuals. Standard criteria comprising statistical significance of the coefficients of the ARCH/GARCH terms, adjusted R-square, Akaike information criterion and Schwarz criterion is used to select the best fitting model.

These diagnostic tests were carried out for all the sixty-one companies. In case of nineteen companies, estimate of beta was found to be insignificant (in some cases it was even negative in sign). Statistical significance was determined at the 10% level, though in the case of only four companies estimate of beta was found to be statistically significant at the 10% level otherwise the remaining estimates were significant at the 5% level. Hence, we had to exclude these nineteen companies from the empirical investigation. This left us with **42** companies[15] for which the estimate of beta is positive and significant.

3.3 Features of the companies finally selected for analysis

The analysis carried out in the present study is based on a sample of forty-two companies. Importantly, there is no news suggesting purchase of shares by the

[15]See the two Tables given in Appendix I for the sample of companies finally selected.

acquirer company in the target company before the merger announcement. Further, no news is found for media speculation of merger in any of the sample companies (except Pond's India ltd., where speculative interest had started to build a week before the announcement[16]). To this extent the share price run-up, if any, prior to the announcement of merger cannot be attributed to these factors.

3.4 Analysis of companies at different levels

Of the forty-two companies finally selected, two companies are BIFR declared companies[17] and the merger announcement was made as part of their rehabilitation package. Further, of the forty non-BIFR companies, twenty-eight are cases of group merger i.e. where the acquirer and acquired belong to the same business group. Given this, the empirical investigation given below has been carried out separately for the following:

- **Set A** comprising 40 companies (excluding two BIFR companies);
- **Set B** comprising 28 Group merger cases and 12 Non-group companies;
- **Set C** comprises the two BIFR companies; and
- Finally, we have also categorised each of the 42 companies individually based on their pattern of stock price and trading volume.

3.5.1 Analysis based on Stock Prices

For the purpose of our analysis, we have used a two-stage approach. The first stage consists of parameter estimation based on the estimation window. This has been done to avoid problems of shifting beta risk due to the event of merger announcement itself. In the second stage, these parameter estimates are used to forecast the returns for stock *j*, for both in sample i.e. for t = -150, …, -51 and out of sample i.e. for t = –50, …, +14 relative to the date of announcement, and denoted by $\hat{R}_{jt}$ The forecasts are made by taking the actual values of the independent variables. The estimated abnormal return for each stock *j* for day *t*, denoted by ε_{jt}, is the difference between the actual return (R_{jt}) and the forecasted return $\hat{R}_{jt}$.

The estimated abnormal return for each security for day t is used to compute the average residual for day t, denoted by $\bar{\varepsilon}_t$. This is defined as the simple arithmetic mean of the estimated abnormal return for all securities for day t. These average residuals are computed for out-of-sample i.e. for t = -50 to + 14. The average residuals so calculated would be the basis for examining unusual price movements prior to the announcement date.

Further, the cumulative average residual (CAR), defined as the sum of previous daily average residuals has also been determined for each trading day of the study as

$$CAR_t = \bar{\varepsilon}_t + CAR_{t-1} \qquad t = -100, \ldots, +14 \qquad (3)$$

If there were no unusual price movements prior to the announcement date, one would expect both the average residual $\bar{\varepsilon}_t$ and cumulative average residual CAR_t to fluctuate randomly about zero. However, if there is leakage of and trading on inside information just prior to the announcement date, this should show up in the form of *positive* daily average residuals as *t* approaches zero and a corresponding build up in CAR_t (Keown & Pinkerton, 1981). Hence the focus of analysis is the sign of average residual $\bar{\varepsilon}_t$ and the movement of cumulative average residual CAR_t as *t* approaches announcement date.

3.5.2 Analysis based on volume pattern

Here, we examine whether the daily average volume calculated for a month (-20 to –1 trading days) prior to merger announcement and two weeks (-10 to –1 trading days) prior to the merger announcement gives any signal of possible presence of insider trading. In order to carry out the analysis we use the following two benchmarks for average volume in *normal* days:

1. Daily average volume calculated for the **third month** (–60 to –41 trading days) prior to the announcement date. This benchmark can be thought of as normal daily average volume in the sense of short term.
2. Daily average volume calculated for the **estimation period** (–150 to –51 trading days) prior to the announcement date. In like manner as the above benchmark, this might be considered as normal daily average volume in the sense of long term.

The daily average volume for each of the company is compared with these two benchmarks and the percentage of companies showing a higher volume is ascertained. Further, we also determine the percentage of higher volume for each of the companies. For our study, we have defined as "significant", if the daily average volume is higher by 100% or more when compared with a particular benchmark.

3.6.1 Analysis for Set A comprising 40 companies

Chart 1 shows the pattern of cumulative average residual (CAR) and average residual (AR) from days –100 to +10 relative to the announcement date. By extending the trading days to day –100, the CAR/AR plot thus covers half of

[16] We carried out the analysis first including Pond's India from the sample and later excluding it, however no significant difference is observed. Further, in the case of analysis done for each company individually, Pond's is placed in the category of "Uncertain cases" for which no clear picture emerges with respect to the incidence of insider trading.

[17] Registered by the Board for Industrial and Financial Reconstruction (BIFR) for revival/rehabilitation.

the estimation window. The dashed line separates the estimation window period from the event window. As can be observed a buildup in the CAR is evident in the event window, whereas for the estimation window a random pattern of CAR emerges. This helps illustrate the goodness of fit of the market model. Further, the buildup in CAR begins from day –43 relative to the date of announcement. From this day onwards, an increasing trend in the CAR is observed, though with occasional dips. However, from day –12 onwards the buildup in CAR is more perceptible as after this day the dip in the curve is less pronounced then that observed before day –12. In fact, average residual is found to be positive in eight out of the ten days immediately preceding the announcement day i.e. during days –10 to –1.

Further, in order to find the announcement effect, we partitioned the period from day –50 to +1 into various sub-periods. Then, we computed the proportion of the total buildup in CAR during this period as accounted by the various sub-periods (Table 1). It is observed that about 37% of the total buildup in CAR is accounted by the ten days immediately preceding the date of announcement, which is significant at the 5% level of significance. Also, a little less than half of the total announcement effect is accounted by the month immediately preceding the announcement, which is also significant at the 5% level of significance. Hence, from the analysis based on Table 1 and Chart 1, we conclude that there exist significant abnormal returns during the period of one month and ten days immediately preceding the announcement date.

Importantly, on eight of the ten days immediately preceding the announcement date, more than 50% of the companies show a positive abnormal return (Table 2). Further, out of the forty sample companies, CAR has been found to be positive in case of twenty-six (65%) companies during the sub-period covering day –10 to –1 (Table 3). Moreover, when we take the window of one-month immediately preceding the announcement date, CAR is positive in case of twenty-four (60%) scrips. This suggests that a significant number of companies contribute to the observed buildup in CAR, which is thus widespread.

Table 1: CAR - Announcement Effect

sub-period	*-50 to –41*	*-40 to -31*	*-30 to -21*	*-20 to –11*	*-10 to -1*	*-20 to –1*	*0 to +1*	*-50 to +1*
CAR	3.018	4.075	3.507	3.525	**10.97**	14.495	4.722	29.817
Announc-ement effect (%)	10.12	13.67	11.76	11.82	**36.79***	48.61*	15.84**	

*, ** indicates that the coefficient is significantly different from zero at the 0.05 and 0.01 levels, respectively (see Appendix II for details regarding the test statistic used)

Chart 1: CAR and AR relative to the announcement day (40 Cos.)

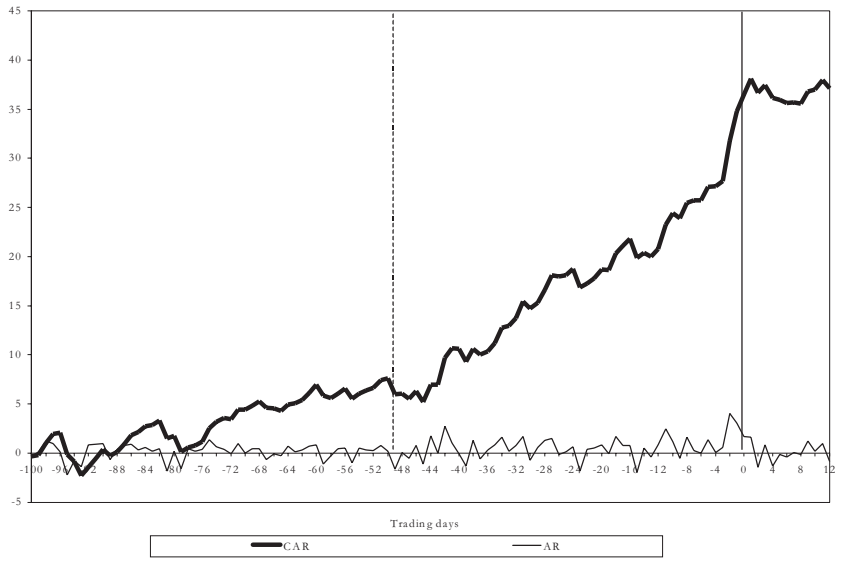


Table 2: Percentage of companies with positive AR on each day

Trading days	% positive residuals
-20	41.03
-19	**50.00**
-18	**51.43**
-17	**51.43**
-16	**54.29**
-15	**60.00**
-14	33.33
-13	**55.56**
-12	42.86
-11	37.84
-10	**52.63**
-9	**52.94**
-8	41.18
-7	**57.14**
-6	41.67
-5	**55.26**
-4	**62.50**
-3	**51.35**
-2	**55.88**
-1	**67.57**
0	**60.00**
1	**56.41**

Table 3: Percentage of Companies with Positive CAR in each sub-period

Trading days relative to announcement date	Scrips with Positive CAR	Percentage
0 to +1 day	28	70
–10 to –1 days	26	65
–20 to –1 day (One month)	24	60

The results suggest that there exist significant abnormal returns prior to the merger announcement, beginning approximately one month before the announcement date. Further, this inference becomes more pronounced when the ten-day period immediately preceding the announcement date is considered.

For further investigation, we look at the trading volume pattern of these forty companies. Since the analysis based on CAR suggests significant abnormal returns during the month (i.e. from day –20 to –1) and the ten days immediately preceding the announcement date, we investigate the volume pattern during these two sub-periods. The volume pattern for these two sub-periods is compared with the two benchmarks of daily average volume pertaining to normal days. This is presented in Tables 4 and 5 respectively.

The **daily average volume for first month** is higher for over 40% of the companies when the benchmark is daily average volume for estimation period with nine (22.5%) of the companies showing significant volume. However, when third month's daily average volume is taken as the benchmark, *55%* of the sample companies show a higher volume with fourteen (35%) companies showing significant volume of more than 100% as compared to the benchmark.

When **the daily average volume for the ten days** immediately preceding the announcement date is considered, it is observed that 45% of the companies show a higher volume then the benchmark calculated over the estimation period. Further, ten of these companies (25% of the sample) show a significant volume. When the third month's daily average volume is taken as the benchmark, *more than half* of the companies show a higher average volume with eleven of these (27.5%) showing a significant volume.

Hence, 40 to 55% of the sample companies show a higher volume as compared to the two benchmarks. Further, the number of companies showing significant volume also range from nine (22.5%) to fourteen (35%).

The investigation carried out thus far suggests that that there is evidence of substantial trading beginning about a month immediately preceding the date of announcement. Further, this evidence is more perceptible during the ten days immediately preceding the announcement date. However, before making any inference about the presence of trading on non-public information one needs to look at the immediate response of the market to the news of merger announcement. *If the news of merger announcement is received as a surprise by the market and there exists substantial trading prior to the announcement, then there is strong evidence for trading based on non-public information.* Given this, we study the CAR and trading volume on the day of announcement and a day after.

CAR and trading volume on days 0 and +1

The pattern of cumulative average return and trading volume on days 0 and +1 capture the immediate response of the market to the merger announcement news. If the merger news comes as a surprise to the market then it should be reflected in the CAR and trading volume for these two days.

Table 1 shows that about 16% of the announcement effect takes place on these two days, which is statistically significant at the 1% level of significance. Further, more than half of the companies show a positive AR on each of these two days with 70% of the sample companies showing a positive CAR over this two-day period (Tables 2 and 3). This implies that on the day of announcement and a day after, there are substantial abnormal returns, which are present for most of the companies. Further, the CAR tends to stagnate or decline after day +2. This shows that the buildup in the CAR due to non-public information is exhausted with the news becoming public. Thus, *the semi-strong form of market efficiency seems to work.*

While studying the immediate reaction of announcement from the volume angle, we compare the daily average volume over these two days with the two benchmarks. It is found that twenty-two (55%) scrips show higher volume as compared to the daily average volume of the estimation period (Table 5) with sixteen (40%) companies turning up a significant volume. Further, when the benchmark is changed to the third month, the number of companies having a higher volume increases to twenty-six (65%) with twenty-one (52.5%) of these showing a significant volume (Table 4).

The above presentation suggests that in majority of the cases news of a merger comes as a surprise to the market.

Hence, based on the significance of CAR and trading volume pattern prior to the merger announcement and the existence of substantial immediate response of the market, we conclude that there is strong evidence suggesting presence of insider trading about a month prior to the merger announcement. Further, this evidence becomes more perceptible during the ten-day period immediately preceding the merger announcement.

Table 4: Distribution of Companies with respect to percentage of higher volume (Benchmark: daily average volume for the third month**)**

% High of Volume	No. & % of Cos. with higher volume for first month	No. & % of Cos. with higher volume for days –10 to -1	No. & % of Cos. with higher volume for days 0 to +1
0-100%	8 (20%)	10 (25%)	5 (12.5%)
100 - 500%	8 (20%)	4 (10%)	11 (27.5%)
500 – 1000%	1 (2.5%)	2 (5%)	3 (7.5%)
> 1000%	5 (12.5%)	5 (12.5%)	7 (17.5%)
Total	**22 (55%)**	**21 (52.5%)**	**26(65%)**

Table 5: Distribution of Companies with respect to percentage of higher volume (Benchmark: daily average volume for the estimation period**)**

% High of Volume	No. & % of Cos. with higher volume for first month	No. & % of Cos. with higher volume for days –10 to -1	No. & % of Cos. with higher volume for days 0 to +1
0-100%	8 (20%)	8 (20%)	6 (15%)
100 - 500%	5 (12.5%)	3 (7.5%)	7 (17.5%)
500 - 1000%	0	3 (7.5%)	2 (5%)
> 1000%	4 (10%)	4 (10%)	7 (17.5%)
Total	**17 (42.5%)**	**18 (45%)**	**22 (55%)**

3.6.2 Analysis for Set B (Group Merger Cos. vs. Non-Group Cos.)

Given the availability of information such as group merger cases i.e. where the acquirer and acquired company belong to the same business group could be separated, we also made an attempt to do a comparative analysis for group merger companies and non-group merger companies. This would help in throwing light on the differences, if any observed between these two sub-sets of companies. There are twenty-eight cases of group merger (excluding the two BIFR cases).

Chart 2 shows the pattern of cumulative average return for the group companies as well as the non-group companies. As is evident, over a large part of the period considered, CAR for the group companies shows a consistently increasing trend whereas a random pattern is observed for the non-group companies. However, as the period approaches the announcement day, an increasing trend is observed in both cases. As shown, CAR for group companies shows a continuous buildup with negligible dips since day –13 and the non-group companies show an increasing CAR from day –10 onwards with only two dips occurring at days –5 and –3 respectively. Table 6 summarises the information pertaining to the announcement effect.

Chart 2: CAR - Group Cos. vs Non-Group Cos.

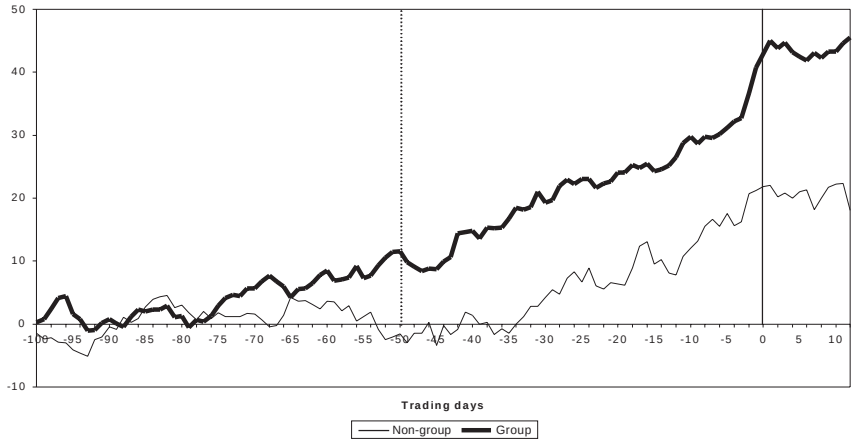


Table 6: CAR Announcement Effect – Group Cos. vs Non-Group Cos.

sub-period	*-50 to -41*	*-40 to -31*	*-30 to -21*	*-20 to -11*	*-10 to -1*	*-20 to -1*	*0 to +1*	*-50 to +1*
Non-Group								
Group	3.877	4.112	3.792	4.196	10.112	14.308	6.288	32.377
Announc-ement Effect	11.97	12.70	11.71	12.96	31.23	44.19*	19.42**	
Non-Group	1.65	3.626	2.802	2.196	12.92	15.116	1.108	24.302
Announc-ement Effect	6.79	14.92	11.53	9.04	53.16	62.2	4.56	

*, ** indicates that the coefficient is significantly different from zero at the 0.05 and 0.01 levels, respectively (see Appendix II for details regarding the test statistic used)

Group Merger Companies

In case where the acquirer and acquired belong to the same business group about 45% of the total buildup in CAR from days –50 to +1 is accounted by the month immediately preceding the announcement day, which is significant at the 5% level of significance. Further, a little over 30% of the announcement effect is captured by the ten days immediately preceding the announcement day, which however is not statistically significant. *This suggests that significant abnormal returns exist for group companies during the month immediately preceding the announcement day.* Hence, further examination of the volume pattern and the post-announcement reaction is required to infer about the presence of insider trading activity, if any.

Table 7 presents the volume pattern of the group companies vis-à-vis the two benchmarks. Since there exist significant abnormal returns for the month immediately preceding the announcement day, we analyse the volume pattern for this period. When compared with the daily average volume for the estimation period, ten (36%) of the twenty-eight group companies show a higher volume during the month immediately preceding the announcement day, with five (18%) of them having a significant volume. When the daily average volume calculated for the third month is considered as the benchmark, fifteen (54%) companies show a higher volume with eight (29%) of them having a significant volume. This suggests the presence of significant volume during the month immediately preceding the announcement day.

Table 7: Trading volume pattern for Group and Non-Group companies

GROUP				NON-GROUP			
daily average volume for the estimation period				daily average volume for the estimation period			
% high of volume	1st month	Days –10 to -1	day 0 to +1	% high of volume	1st month	Days –10 to -1	day 0 to +1
0-100	5 (17.86%)	6 (21.43%)	2 (7.14%)	0-100	3 (25%)	2 (16.67%)	4 (33.33%)
100-500	2 (7.14%)	3 (10.71%)	7 (25%)	100-500	3 (25%)	0	2 (16.67%)
500-1000	0	0	1 (3.57%)	500-1000	0	3 (25%)	1 (8.33%)
>1000	3 (10.71%)	3 (10.71%)	4 (14.29%)	>1000	1 (8.33%)	1 (8.33%)	2 (16.67%)
Total	**10 (35.71%)**	**12 (42.86%)**	**14 (50%)**	**Total**	**7 (58.33%)**	**6 (50%)**	**9 (75%)**
daily average volume for the 3rd month				daily average volume for the 3rd month			
% high of volume	1st month	Days –10 to -1	day 0 to +1	% high of volume	1st month	Days –10 to -1	day 0 to +1
0-100	7 (25%)	9 (32.1%)	4 (14.29%)	0-100	1 (8.33%)	1 (8.33%)	1 (8.33%)
100-500	5 (17.86%)	3 (10.71%)	8 (28.57%)	100-500	3 (25%)	1 (8.33%)	4 (33.33%)
500-1000	0	1 (3.57%)	1 (3.57%)	500-1000	1 (8.33%)	1 (8.33%)	1 (8.33%)
>1000	3 (10.71%)	3 (10.71%)	5 (17.86%)	>1000	2 (16.67%)	2 (16.67%)	2 (16.67%)
Total	**15 (53.57%)**	**16 (57.14%)**	**18 (64.29%)**	**Total**	**7 (58.33%)**	**5 (41.67%)**	**8 (66.67%)**

Finally, we examine the immediate reaction of the market to the news of merger announcement by analysing the pattern of CAR and trading volume on days 0 and +1. The CAR over this two-day period accounts for a little less than 20% of the total buildup in CAR, which is found to be significant at the 1% level of significance (Table 6). In the context of the volume pattern, fourteen (50%) of the companies show a higher volume when compared with the daily average volume for the estimation period with twelve (43%) having a significant volume. Further as compared to the daily average volume for the third month, over 64% of the companies show a higher volume with about 50% of them showing a significant volume. This suggests the presence of significant volume during days 0 and +1. Hence, the immediate reaction of the market to the merger announcement is found to be significant both in terms of abnormal returns as well as trading volume.

With this as a backdrop, we conclude that in case of companies belonging to the same business group, there exists evidence for the presence of insider trading activity during the month immediately preceding the merger announcement date.

Non-Group Merger Companies

For this set of companies, the month immediately preceding the announcement day accounts for over 60% of the total buildup in CAR for days –50 to +1. Further, over 50% of this buildup takes place during the ten days preceding the announcement day. Importantly, neither was statistically significant at the 5% significance level. Hence, *this suggests that there do not exist significant abnormal returns during either the month or ten-day period immediately preceding the announcement day.* Thus, in case of non-group companies there is no prima facie evidence for the existence of trading activity based on non-public information. Further, the immediate response of the market to merger news is also not significant as the CAR over days 0 and +1 accounts for just 5% of the total buildup and is also not statistically significant.

The above discussion suggests that non-group companies do not show significant abnormal returns immediately prior to merger announcement. Further, the immediate response in terms of abnormal returns is also insignificant. Thus, based on the criteria followed in the paper, we cannot infer the presence of insider trading activity in case of non-group companies.

In nutshell, group merger companies in our sample show presence of trading based on non-public information, which however does not exist for non-group merger companies.

3.6.3 Analysis for Set C comprising the two BIFR companies

Of the forty-two companies finally selected, the two BIFR companies that have been analysed are Gujarat Sidhee Cement and Swastik Rubber. For these two companies, merger announcement was made by the BIFR as part of their rehabilitation package.

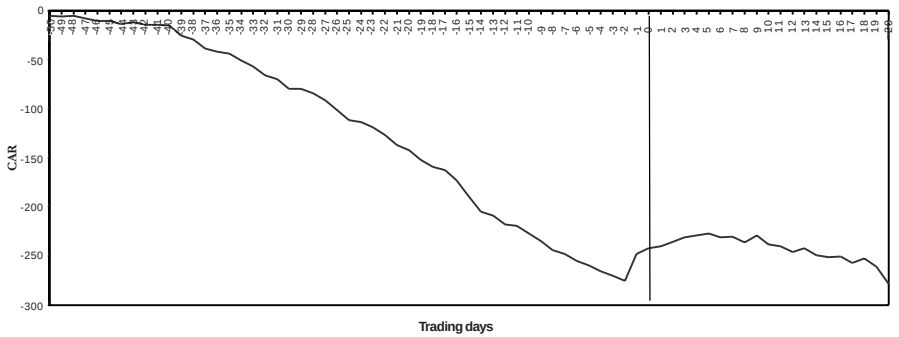
On observing the graph of CAR for the BIFR companies, it is evident that CAR generated by these two companies is consistently negative through the period of analysis. This suggests that in these companies the market doesn't take much interest. However, some activity is evident during the time surrounding the merger announcement. During the period from day –1 to day +5 relative to the announcement date, CAR is increasing. This is supported by the fact that the average residual during these seven days is positive implying existence of excess returns. In terms of individual companies, whereas Gujarat Sidhee shows a positive excess return during all these seven days, Swastik Rubber shows a positive excess return only on the second day after the announcement date. In the case of Gujarat Sidhee, the presence of a positive CAR a day before the merger announcement raises suspicion.

To examine the volume pattern, we compared the daily average volume of these BIFR companies with the two benchmarks. When compared with either benchmark Gujarat Sidhee shows a significant volume in both the sub-periods considered, i.e. a month and ten days immediately preceding the announcement. For instance, in the ten days immediately preceding the announcement, the daily average volume of Gujrat Sidhee was **higher by 37408%** when compared with the third month. In case of Swastik Rubber the volume pattern was significant (145%) when the daily average volume for the month prior to announcement is compared with the benchmark of third month.

In terms of immediate response, the CAR for day 0 and +1 for Gujarat Sidhee stood at positive high of 19.8, while it was –4.6 for Swastik. Further, the volume response was once again significant in case of Gujarat Sidhee for both benchmarks. In case of Swastik Rubber the volume response was significant when compared with the benchmark of third month.

The above presentation suggests that the substantial trading evident in Gujarat Sidhee immediately prior to the merger announcement raises doubt and requires further investigation.

Chart 3: CAR relative to the announcement day (BIFR Cos.)



3.6.3 Analysis for each of the 42 individual companies

The analysis presented in the previous two sections suggests that there exist trading based on non-public information. Given this, in this section we make an attempt to highlight the companies where investigation is required for insider trading and companies which do not exhibit insider trading activity. With this as the objective we have defined the following three categories of companies based on the criteria given along side. The distribution of companies according to these three categories is given in Table 8.

Category I: Companies where investigation is recommended for the presence of insider trading

Under this category we include companies that satisfy *all* the following criteria

- Cumulative Abnormal Return is positive for the sub-periods viz., day –20 to –11 (corresponding to one month prior to announcement) and day –10 to –1. Further, the CAR is higher than the sample mean for either of the two sub-periods. The mean CAR is 14.495 and 10.97 for the first month and ten-day sub-periods respectively (see Table 1).
- Daily average volume calculated for the either of the two sub-periods is significant (higher by at least 100%) when compared with at least one of the benchmarks.
- The immediate response of the market examined for day 0 and +1 is substantial as measured by a positive CAR and significant volume when compared with the two benchmarks.

We select six companies that satisfy all the above criteria. Hence, *for all these six companies we recommend investigation by the market regulator for the presence of insider trading.*

Category II: Companies that do not exhibit insider trading activity

This category includes those companies which satisfy *all* the following criteria

a) the cumulative abnormal return (CAR) is positive and below the sample mean for either of the sub-periods considered; and

b) do not show a higher volume in either of the two sub-periods as compared to the relevant benchmark

There are *eight* companies that satisfy these criteria.

Category III: Uncertain Cases

Those companies that do not fall in any of the above two categories are included here. In their case the CAR and trading volume do not show a pattern as is required for them to be included in any of the above two categories. In case of companies falling in this category further investigation is required such as they can be included in either category I or category II.

IV Conclusion, Policy Implications and Future Research

4.1 Conclusion

This papers examines the stock price effects and trading volume pattern for the possible existence of informed trading prior to merger announcement. The investigation is based on a database of companies for which merger announcement date has been announced during 1996-1999. The analysis has been done for 150 trading days prior to the announcement and 15 days on and after the announcement date. The analysis is based on the examination of the pattern of stock prices and trading volume of the sample companies. For examining the pattern of stock prices, average residuals (AR) and Cumulative Average Residuals (CAR) have been calculated for the sample. The analysis examines the following:

- abnormal returns prior to merger announcement;
- trading volume prior to merger announcement; and
- immediate market reaction to the merger news in terms of abnormal returns and trading volume

Table 8: Categorization of all the 42 companies based on the criteria proposed

* in a cell indicates that the daily average volume is not higher as compared with the benchmark considered	*Days -20 to -1 (one month)*			*Days -10 to -1*			*Days 0 and +1*		
	CAR	% volume high		CAR	% volume high		CAR	% volume high	
		3rd month	*est. period*		*3rd month*	*est. period*		*3rd month*	*est. period*
Investigation recommended for existence of insider trading									
IBP Co.	41.93	249	417	29.67	359	579	11.4	858.31	1316.94
Cochin Refineries Balmer Lawrie Ltd.	10.34	350	47	14.67	*	*	40.08	4678.57	1470.32
Narmada Cements	107.49	2559	1826	93.58	4731	3399	20.03	1779.58	1261.62
Cheminor Drugs	4.88	2241	1657	20.77	1568	1152	4.01	2726.61	2022.05
Balaji Foods and Feeds Ltd.	67.95	1066	2004	64.95	2078	3828	33.03	13375.42	24205.5
TTK Biomed	307.34	408	*	152.40	580	*	49.4	4661.36	426.8
Companies that do not exhibit insider trading activity									
Tuticorin Alkali Chemicals & Fertilisers Ltd.	4.34	*	*	-9.87	*	29	10.51	*	*
20th Century Finance Corpn. Ltd.	6.02	*	*	0.44	*	*	10.87	154.38	174.98
Asian Coffee Ltd.	-3.95	*	*	4.72	*	0.89	-2.4	-11.89	14.04
Cyanamid Agro	9.68	*	*	2.73	*	*	-2.62	13.27	*
Tata Infotech	0.11	1.35	*	0.35	*	*	10.07	*	*
South India Shipping Corporation Ltd.	-13.66	*	*	4.82	*	*	3.75	*	*
Light Metal Industries Ltd.	-17.64	*	*	4.61	*	*	37.84	*	*
Krishna Lifestyle Technologies Ltd.	-21.37	*	*	2.35	*	*	3.17	*	*
Not Certain									
Lloyds Steel	-18.26	1641	235	-4.69	3156	527	1.98	7995.69	1460.94
Modern Terry Towel	-1.14	723	454	-5.95	969	620	-4.63	188.78	94.47
Gujarat Sidhee Cement Ltd.	-168.82	20034	1983	-53.18	37408	3781	19.8	6180.77	549.91
VST Ltd.	15.9	1987	1096	-14.22	2904	1622	1.7	47	*
Akar Laminators	-29.41	*	170	-5.28	*	192	-13.87	12.61	449.76

Contd...

Table 8: Categorization of all the 42 companies based on the criteria proposed

* in a cell indicates that the daily average volume is not higher as compared with the benchmark considered	*Days -20 to -1 (one month)*			*Days -10 to -1*			*Days 0 and +1*		
	CAR	% volume high		CAR	% volume high		CAR	% volume high	
		3rd month	*est. period*		*3rd month*	*est. period*		*3rd month*	*est. period*
BS Refrigerators Ltd. (earlier BPL Refrigeration)	6.61	192	87	-22.04	228	110	-11.2	460.96	259.02
Swastik Rubber	-22.18	145	*	-15.71	33.68	*	-4.58	120.18	*
Laser Lamps	-8	148	*	-4.43	63.72	*	9.29	144.38	*
TVS Suzuki Ltd.	12.2	326	100	1.47	439	157	1.16	142.09	15.59
Arvind Polycot Ltd.	3.87	14	42	-15.32	18	47	22.02	162.45	225.32
Pond's India Ltd.	1.35	*	52	1.70	3.66	89	7.01	911.24	1750.29
Grauer & Weil (I)	36.49	43	*	16.29	31	*	3.33	NA	NA
Gujarat Ambuja Cotspin Ltd.	24.41	21	*	20.29	43	7.4	4.79	*	*
Maxworth International	23.66	334	92	9.71	*	*	-7.32	*	*
Maxworth Orchards	23.61	334	97	9.74	*	*	-7.37	*	*
Jain Plastics and Chemicals	11.02	43	35	12.82	*	*	3.12	174.51	158.63
Khaitan Electricals	-0.22	44	*	8.37	130	34	-24.96	64.63	-3.94
Mcleod Russel	-8.68	34	*	-25.35	42	*	12.08	172.48	81.11
ITC Classic Finance Ltd.	2.11	21	*	8.02	38	*	-39.77	2266.52	537.96
Standard Batteries	15.79	*	*	16.82	9.92	*	-26.05	385.71	133.19
Aarti Industries Ltd.	31.74	*	*	30.46	*	1.5	15.97	*	1.05
Rajashree Polyfil Ltd.	15.4	*	*	19.86	*	*	4.68	537.95	566.7
Essar Shipping	34.03	*	*	22.18	1.42	37	1.65	*	*
Modern Denim	-21.84	*	*	-20.10	*	*	5.78	179.11	83.07
Arihant Cotsyn Ltd.	-39.96	*	*	-7.03	27	*	21.33	*	*
Asian Cables and Industries Ltd.	-18.33	*	*	-17.36	*	*	-27.89	67.68	*
HBL Nife Power Systems Ltd. (earlier Sab Nife Power Systems Ltd.)	-23.96	*	*	-13.23	*	*	8.75	*	*
Modi Xerox Ltd.	-36.67	*	*	-14.42	*	*	-3.48	*	*

The analysis has been done separately for forty companies, excluding the two BIFR companies. In case of this set of companies there is strong evidence suggesting existence of insider trading activity. Further, these forty companies were divided into cases of group merger i.e. where the acquirer and acquired companies belong to the same business group and those that do not. There were twenty-eight cases of group merger and twelve non-group mergers. In this part of the analysis, we found evidence for the presence of insider trading activity in case of companies belonging to the same business group. However, such an inference cannot be drawn in case of non-group companies. In case of the two BIFR companies, there is evidence of some abnormal activity a day before the announcement. Finally, we carried out the analysis for each company individually. Based on the criteria mentioned in the text we recommend investigation in six companies for existence of insider trading. Further, there are eight companies which do not exhibit insider trading activity. All the remaining companies have been placed in the 'uncertain' category as in their case further investigation is required.

4.2 Policy Implications

The results have immediate public policy implications. The analyzed cumulative average return and trading volume pattern provide a base for the argument that stock price run-ups before merger announcement reflect widespread insider trading. The finding that informed trading transmits private information has public policy implications for capital-market regulation issues. That insider trading is rampant in Indian markets is no big revelation. In fact, the problem is so deep that it is difficult to find out instances where there has been no abnormal price movement before a major corporate announcement. What is more worrying is that in all these years SEBI has done very little apart from initiating probes, that too, very often, only after media outcry. To be fair, insider trading is difficult to prove. If regulators manage to catch some offenders, they get away with punishment not commensurate with their crime.

The purpose of this study is to devise and apply the mechanism for detecting insider trading. Our purpose is neither to suggest how to prevent insider trading nor to decide how to penalize the persons alleged as inside traders. Be that as it may, there are few observations specifically in relation to insider trading in India.

In the stock exchanges of the developed world, it is possible to go back and trace every single transaction due to their electronic record and archival system. If we can have such an effective system in India, authorities can reach the root cause of such alleged insider trading. In several stock exchanges across the country, there is no universal client ID system prevalent that would let authorities keep track of each individual investment. This means the route for 'benami' transactions through multiple trading accounts is open. Another way

out is electronic share system or dematerialized securities, the latter one although has started but still a lot needs to be done.

The Kumar Manglam Birla committee has been set up by SEBI for looking into the issue of framing norms to eliminate insider trading. The committee has agreed on making it mandatory for some key management personnel in a company to disclose their sale and purchase of stocks. The committee is also of the view that companies must disclose only public information to analyst and researchers. But it is not clear whether the information gathered as a part of due diligence before the Merger and Acquisition deal is struck will be treated as price sensitive information and the acquisition for the deal would amount to insider trading. The issue is that a purely self-regulatory framework would not have adequate enforceability.

SEBI also needs to re-address the issue of insider trading liability. Clarification is also sought in 'using' or 'knowing possession' of material non-public information. The prohibition in the regulation do not include 'causes to communicate' in the definition of communication of any unpublished price-sensitive information as it is likely that instead of communicating directly, the insider may cause such information to be communicated. However, to what extent the watch dog and market participants are able to enforce it has to be seen. As far as Sebi's ability to implement these guidelines is concerned, "Enforcement is the key to success of the regulation."

The practical limitations to sue every transaction based on (perhaps only slightly) better information, make it certainly useful to examine possible economic trade-offs arising in the context of insider trading regulation. A better understanding of the economic effects of insider trading could potentially enable us to identify more clearly which forms of insider trading are more damaging and who actually is the victim of insider trading. One way to restrict the scope of fairness considerations and to link it to economic arguments is the notion of 'confidence' in the markets, i.e., to prosecute insider trading only as far as it undermines the 'confidence' in the financial markets. The broad objective of the U.S. securities laws of the 1930s was to restore public confidence in the capitalist economy as a whole and the capital markets as their central allocation mechanism for investments in particular. Confidence in capital markets is of course a rather vague term with many different connotations and has to be clearly defined in the Indian context.

4.3 Future Research

We have confined our study to mergers announcement. This study can also be extended to takeover announcements. One more issue that this work raises for future research is the effect of insiders' behaviour on liquidity. Another possible area for future research concerns the effect of insider trading on the probability of completion of merger. Insider trading could also raise the cost of merger by

increasing the premium offered to stockholders. This work yields a major implication for future research. Future research should also take into account the adjustment with respect to dividends in stock price, which is generally not published. In the context of the methodology used, a more general switching regression model can also be used to address the issue of non-stationarity of the market model parameters and its subsequent effect on the residual analysis.

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APPENDIX I

Table A: Number of Companies selected for the present study

Particulars	No. of Cos.
No of companies for which merger announcement date obtained	139
No of companies for which data on stock prices and trading volume obtained from the sources as mentioned in the text	99
No. of companies left after deleting those for which no data is available for the ten days immediately preceding the announcement date	67
No of companies for which sufficient number of observations available for estimation purposes (i.e. at least 50 observations available)	61
No of companies for which the estimate of the parameter beta was positive and statistically significant	42

Table B: Names and other characteristics of the sample companies

Acquired/Target	Source of details	Date	News Paper	BIFR case	Group
20th Century Finance Corpn. Ltd	Prowess	05/11/98	HU		
Aarti Ind. Ltd.	Prowess	23/07/97	BL		
Akar Laminators	Prowess	15/10/99	BS		yes
Arihant Cotsyn Ltd.	Prowess	18/02/98	ET		yes (Arihant group)
Arvind Polycot Ltd.	Prowess	22/01/99	BL		yes
Asian Cables and Industries Ltd.	indiainfoline.com	26/03/97	BS		yes
Asian Coffee Ltd.	Prowess	05/06/98	BL		
Balaji Foods and Feeds Ltd.	Prowess	14/10/99	BL		yes
BS Refrigerators Ltd. (earlier BPL Refrigeration)	Prowess	24/07/99	BS		yes
Cheminor Drugs	Prowess	11/03/99	BS		yes
Cochin Refineries Balmer Lawrie Ltd.	Prowess	12/09/98	BL		yes (Joint Venture)
Cyanamid Agro	Prowess	06/10/99	FE		yes
Essar Shipping	Prowess	24/04/96	PR		yes (Essar)
Grauer & Weil (I)	Prowess	24/08/98	ET		yes (More)
Gujarat Ambuja Cotspin Ltd.	indiainfoline.com	18/04/98	BL		yes
Gujarat Sidhee Cement Ltd.	Prowess	31/12/97	BS	yes	yes (Mehta)

Acquired/Target	Source of details	Date	News Paper	BIFR case	Group
HBL Nife Power Systems Ltd. (earlier Sab Nife Power Systems Ltd.)	Prowess	10/05/99	ET		
IBP company	Prowess	08/08/97	PR		
ITC Classic Finance Ltd	Indiainfoline.com	26/11/97	FE		
Jain Plastics and Chemicals	indiainfoline.com	07/04/97	ET		yes
Khaitan Electricals	Prowess	25/09/98	BS		yes
Krishna Lifestyle Technologies Ltd. (earlier Shree Krishna Polyster)	Prowess	07/08/98	ET		yes
Laser Lamps	indiainfoline.com	10/09/97	BS		yes
Light Metal Industries	indiainfoline.com	28/10/97	BS		yes (BM Khaitan)
Lloyds Steel	Prowess	08/02/97	FE		
Maxworth International Ltd.	Prowess	30/10/96	BL		
Maxworth Orchards	indiainfoline.com	30/10/96	BL		
McLeod Russel	indiainfoline.com	25/09/96	BS		yes (BM Khaitan)
Modern Denim	Prowess	08/08/96	BS		
Modern Terry Towel	Prowess	08/08/96	BS		
Modi Xerox Ltd.	Prowess	06/05/99	HT		yes
Narmada Cements	Prowess	05/01/99	BS		
Pond's India	Prowess	12/02/98	BS		yes
Rajashree Polyfil Ltd.	indiainfoline.com	07/05/97	ET		yes (Birla)
South India Shipping Corporation	indiainfoline.com	20/06/97	BL		yes (Essar)
Standard Batteries Khaitan	Prowess	24/11/97	ET		yes (BM
Swastik Rubber Products Ltd.	Prowess	11/02/97	BL		yes
Tata Infotech	Prowess	28/03/98	FE		yes
TTK Biomed	Prowess	20/08/99	FE		yes
Tuticorin Alkali Chemicals & Fertilisers Ltd.	Prowess	20/03/98	ET		yes (MAC)
TVS Suzuki Ltd.	Prowess	05/05/98	BL		yes
VST Industries Ltd.	Prowess + BSE	22/08/96	BS		yes (BAT, UK)

BS: Business Standard FE: The Financial Express BL: Business Line
ET: The Economic Times HU: The Hindu HT: The Hindustan Times

APPENDIX II

Computation of the test static for hypothesis test over multi-day intervals i.e. for ascertaining the statistical significance of CAR for the various sub-periods (Reference: Brown and Warner 1985)

Let A_{it} denote the excess return (abnormal return) for security 'i' on day 't'. This is the difference between the actual return (R_{it}) and the forecasted return $\hat{R}_{it}$ We give the calculation of test statistic pertaining to the hypothetical interval (-5, +5).

Define $$A^*_{i,t} = \frac{\sum_{t=-5}^{+5} A_{i,t}}{\left(\sum_{t=-5}^{+5} \hat{S}^2(A_{i,t}) \right)^{1/2}}$$

Where $$\hat{S}^2(A_{i,t}) = \left(\sum_{t=-150}^{-51} (A_{i,t} - \overline{A}_i)^2 \right) \Big/ 99$$

t = -150 to –51 pertains to the estimation period considered in the paper.

$$\overline{A}_i = \frac{1}{100} \sum_{t=-150}^{-51} A_{i,t}$$

The test statistic for the hypothetical interval (-5 to +5) is given by

$$\left(\sum_{i=1}^{N_t} A^*_{i,t} \right) (N_t)^{-\frac{1}{2}}$$

N_t is the number of sample securities during the hypothetical interval (-5 to +5). The test statistic is distributed Student-t under the null hypothesis of zero excess return or no abnormal performance.